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U.S. PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:

Giampiero MORINI et al.

Serial No.: 08/603,497

Group Art Unit: 1505

Filed: February 20, 1996

Examiner: E. Smith

For: 1,3-DIETHERS AND COMPONENTS AND CATALYSTS FOR THE  
POLYMERIZATION OF OLEFINS, CONTAINING SAID DIETHERS

APPEAL BRIEF TRANSMITTAL

Assistant Commissioner for Patents  
Washington, D.C. 20231

October 3, 1997

Sir:

Submitted herewith are an original and two copies of an Appeal Brief in this U.S. patent application.

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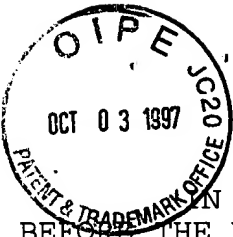
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BRIEF ON APPEAL

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I. REAL PARTY IN INTEREST

An assignment of the inventions claimed in this application from the Appellants to Montell North America Inc., a Delaware corporation, is recorded in the U.S. Patent and Trademark microfilm records at Reel 7998, Frame 336. Accordingly, the real party in interest is Montell North America Inc.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellants, the Appellants' legal representative, or Montell North America Inc. which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-29 are pending, while non-elected claims 30-40 have been canceled. The status of pending claims 1-29 is as follows:

1. Dependent claims 7 and 21 have been allowed.
2. Claims 1-6, 8-20, and 22-29 stand finally rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 5,122,492 to Albizzati et al., U.S. Patent No. 5,068,213 to Albizzati et al. and U.S. Patent No. 4,978,648 to Barbé et al., all together or all in view of Japanese Patent Publication No. 2-242,804 to Denko.

IV. STATUS OF AMENDMENTS AFTER FINAL REJECTION

The Amendment After Final Rejection filed June 23, 1997 has been entered. This Brief on Appeal assumes the Supplemental Amendment filed concurrently herewith will be entered.

V. SUMMARY OF THE INVENTION

The Appellants have discovered that the use of specified 1,3-diethers as either internal or external electron donors to olefin polymerization catalyst permits very high levels of stereospecificity while maintaining high catalytic activity (Specification, page 3, lines 2-7 and lines 23 to page 4, line 4). A key feature of these 1,3-diethers is a "cyclopolyenic" structure which includes the 2-position carbon atom of the 1,3-diether and has multiple unsaturation. Accordingly, claims 1-11 are directed to a solid catalyst component for the polymerization of olefins, comprising a magnesium halide in active form, and, supported thereon, a titanium compound containing at least one Ti-halogen bond and a cyclopolyenic 1,3-diether of specified structure. Claims 12-15 specify an olefin polymerization catalyst comprising the solid catalyst component of claim 1, an Al-alkyl compound and optionally an electron donor compound other than the cyclopolyenic 1,3-diether. Claims 16-28 recite a catalyst for the polymerization of olefins comprising the product of the reaction between (A) a solid catalyst component comprising a magnesium halide in active form and, supported thereon, a titanium compound containing at least one Ti-halogen bond and an electron-donor compound; (B) an Al-alkyl compound; and (C) a cyclopolyenic 1,3-diether of specified formula, while claim 29 specifies a process for the polymerization of  $\text{CH}_2=\text{CHR}$  olefins in the presence of a catalyst as defined in claims 12 or 16.

The cyclopolyenic structure which includes the 2-position carbon atom is a cyclic or polycyclic structure made up of 5, 6, or 7 carbon atoms, or 5-n or 6-n' carbon atoms, and respectively n atoms of nitrogen and n' heteroatoms selected from the group consisting of O, S and Si, where n is 1 or 2 and n' is 1, 2 or 3, this cyclopolyenic structure containing two or three unsaturations and optionally being condensed with other cyclic structures, or substituted with one or more substituents selected from the group consisting of linear or branched alkyl radicals; cycloalkyl, aryl, aralkyl, alkaryl radicals and halogens, or being condensed with other cyclic structures and substituted with one or more of the above mentioned substituents which can also be bonded to the condensed cyclic structures; one or more of the above mentioned alkyl, cycloalkyl, aryl, aralkyl or alkaryl radicals and the condensed cyclic structures optionally containing one or more heteroatoms as substitutes for carbon or hydrogen atoms, or both (Specification, page 4, line 5 to page 5, line 4).

The diethers of the present invention can be produced by an improved synthesis which permits higher yields in less reaction time than the known etherification reaction from corresponding diols. The improved synthesis is the subject matter of canceled non-elected claims 37-40 (Specification, page 14, line 14 to page 15, line 8).

## VI. ISSUE

Whether claims 1-6, 8-20, and 22-29 define patentable subject matter under 35 U.S.C. § 103(a) over U.S. Patent No. 5,122,492 to Albizzati et al., U.S. Patent No. 5,068,213 to Albizzati et al. and U.S. Patent No. 4,978,648 to Barbé et al., all together or all in view of Japanese Patent Publication No. 2-242,804 to Denko.

## VII. GROUPING OF CLAIMS

The claims do not stand or fall together because dependent claims 7 and 21 have been allowed.

## VIII. ARGUMENT

The cited prior art merely lists structural analogs of the cyclopolyenic 1,3-diethers of the present invention among numerous non-structural analogs. There is no suggestion to modify these structural analogs to arrive at the cyclopolyenic 1,3-diethers of the present invention and the homolog rule does not extend to structural analogs.

### A. THE CITED COMBINATION OF REFERENCES FAILS TO DISCLOSE OR SUGGEST THE CYCLOPOLYENIC 1,3-DIETHERS OF THE PRESENT INVENTION

When features of prior art references are modified to establish obviousness, the mere possibility of such a modification is insufficient. Instead, a reference may only be modified when (1) the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or carry

out the claimed process, and (2) that those of ordinary skill in the art would have a reasonable expectation of success in making the claimed composition or performing the claimed process. Accord, In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). In this case, the primary references fail to disclose or suggest the 1,3-cyclopolyenic diethers of the present invention all taken together, or all in view of Denko.

1. Albizzati '492 Fails to Disclose or Suggest Cyclopolyenic 1,3-Diethers

Albizzati '492 teaches 1,3-diethers of specified formula which are preferred as olefin polymerization catalyst components in which R<sub>1</sub> and R<sub>2</sub> are hydrogen, C<sub>1-18</sub> alkyl, C<sub>3-18</sub> cycloalkyl, C<sub>6-18</sub> aryl and C<sub>7-18</sub> aralkyl or alkaryl radicals bonded to the 2-position carbon atom. Their definitions do not include a ring which includes the 2-position carbon atom and has multiple unsaturations. The reference does not teach that R<sub>1</sub> and R<sub>2</sub> can be bonded together to form a ring. See col. 2, line 59 to col. 3, line 55. Albizzati '492 also lists other diethers which do not come within the preferred formula at Col. 3, line 60 to Col. 4, line 22. None of these non-preferred compounds are cyclopolyenic 1,3-diethers.

The Examiner has indicated that he would reconsider this rejection if the prior art does not disclose an analogous diether in which the 2-position is part of a saturated ring system.<sup>1</sup> Although the reference lists several such analogs among the non-

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<sup>1</sup> Examiner Interview Summary Record dated July 25, 1997.

preferred diethers, one of ordinary skill in the art is not given any suggestion or motivation to modify these analogs by incorporating additional unsaturation into the ring containing the central (2-position) carbon atom because (1) the seven<sup>2</sup> possible<sup>3</sup> analogs listed in Albizzati '492 are merely included among many other non-analogous, non-preferred diethers, and (2) Col. 4, lines 23-30, teaches that other diethers which do not include the 2-position carbon in a saturated ring system are particularly preferred, thereby leading away from even the non-multiply unsaturated analogs of the cyclopolyenic 1,3-diether of the claimed invention.

2. Albizzati '213 Fails to Disclose or Suggest Cyclopolyenic 1,3-Diethers

Albizzati '213 generally<sup>4</sup> discloses that diethers which contain at least one specified heteroatom, or at least one double bond, or both, have utility as catalyst components for olefin

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<sup>2</sup> 1,1-dimethoxymethyl-1,2,3,4-tetrahydronaphthalene, 1,1-dimethoxymethyl-decahydronaphthalene, 1,1-dimethoxymethyl-indane, 2,2-dimethoxymethyl-indane, 1,1-dimethoxymethyl-2-isopropyl-5-methylcyclohexane, 1,1-bis(methoxymethyl)cyclohexane; and 1,1-dimethoxymethyl-cyclopentane. See Col. 3, line 60 to Col. 4, line 22.

<sup>3</sup> Albizzati '213 lists additional compounds where the central carbon is part of a saturated ring, but where it would be impossible to introduce 2 or more unsaturations, e.g., 2,2-bis(methoxymethyl)-5-chloro-bicyclo[2.2.1]heptane.

<sup>4</sup> For convenience only, Appellants have labelled portions of Albizzati '213 as "general", "preferred" and "specific" disclosures of the diethers disclosed therein.

polymerization (Col. 2, lines 3-8). The reference then provides an "preferred" disclosure of 1,3-diethers of specified formula which are particularly useful (Col. 2, lines 9-60), and also provides a "specific" disclosure listing representative diethers.

Albizzati '213 does not expressly disclose the cyclopolyenic structural feature of the 1,3-diethers of the present invention, and one of ordinary skill is given no suggestion or motivation to modify the Albizzati '213 diethers to arrive at the cyclopolyenic 1,3-diethers of the present invention. More particularly, the Albizzati '213 "general" disclosure is devoid of any suggestion to use 1,3-diethers having a cyclopolyenic ring which includes the 2-position carbon atom, or that the use of such cyclopolyenic 1,3-diethers as either internal or external electron donors to olefin polymerization catalysts permit very high levels of stereospecificity while maintaining high catalytic activity.

The Albizzati '213 "preferred" disclosure defines a structural formula for "particularly useful" 1,3-diethers. Although unsaturated radicals are included within the definitions of  $R_1$ ,  $R_2$ , X and Y, there is no suggestion of a cyclopolyenic ring which includes the 2-position carbon atom. More particularly, X and Y are radicals attached to the central carbon of the 1,3-diether. Although X may be unsaturated, there is no cyclic structure identified wherein the central carbon atom is part of the ring. Similarly, Y is either hydrogen, a  $C_{1-18}$  hydrocarbyl radical, or the same as X when X is certain compounds. See col. 2, lines 25-53.

Albizzati '213 also discloses teaches that X and Y can be bonded together to form a C<sub>1-18</sub> hydrocarbon ring, optionally containing selected heteroatoms and optionally bonded to the central carbon atom through a double bond (Col. 2, lines 54-60). However, this disclosure does not suggest the multiply unsaturated cyclic structure required by the claimed invention, particularly in view of the non-cyclic definition of X (when it is not bonded to the Y radical) which can contain "at least one double bond".

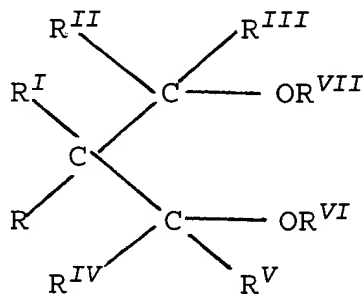
The Albizzati '213 "specific" disclosure lists "representative" 1,3-diethers which contain halogen atoms (Col. 2, line 61 to Col. 3, line 58), diethers which contain heteroatoms other than halogens (Col. 3, line 59 to Col. 4, line 35), unsaturated 1,3-diethers (Col. 4, line 36 to Col. 5, line 11), and diethers which contain heteroatoms and unsaturation (Col. 5, lines 12-52). None of these diethers contain the cyclopolyenic structure required by the present invention.

As discussed above, the Examiner has indicated that he would reconsider this rejection if the prior art does not disclose an analogous diether in which the 2-position is part of a saturated ring system. Albizzati '213 lists several mono-unsaturated analogs among many other, non-analogous diethers. However, one of ordinary skill in the art is not given any suggestion or motivation to modify these mono-unsaturated analogs by incorporating additional unsaturation into the ring containing the central (2-position)

carbon atom because the three<sup>5</sup> possible analogs listed in Albizzati '213 are described as "diethers containing halogen atoms" (Col. 2, lines 61-62) rather than being identified as "unsaturated diethers" at Col. 4, line 36 et seq. One of ordinary skill in the art *might* consider additional halogenation, but is given no suggestion to incorporate additional unsaturation into these diethers.

3. Barbé et al. Fails to Disclose or Suggest Cyclopolyenic 1,3-Diethers

Barbé discloses that 1,3-diethers of specified formula are suitable as electron donors for olefin polymerization catalysts. The structural formula is very broad:



in which R, R<sup>I</sup>, R<sup>II</sup>, R<sup>III</sup>, R<sup>IV</sup>, R<sup>V</sup> are the same or different and are H, linear or branched alkyl radicals, or cycloalkyl, aryl, alkylaryl or arylalkyl radicals with 1-18 carbon atoms, provided R<sup>I</sup> and R are not both hydrogen; R<sup>VI</sup> and R<sup>VII</sup> have the same meaning of R and R<sup>I</sup> except for hydrogen; provided that when R<sup>I</sup> to R<sup>V</sup> are hydrogen and R<sup>VI</sup> and R<sup>VII</sup> are methyl, R is not methyl; and two or more R to R<sup>VII</sup> can be linked to form a cyclic structure.

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<sup>5</sup> 1,1-bis(methoxymethyl)-4-chloro-decahydronaphthalene, 1,1-bis(methoxymethyl)-6-chloro-tetrahydronaphthalene, and 1,1-bis(methoxymethyl)-2-isopropyl-5-chloro-cyclohexane. See Col. 3, lines 25-31.

(Col. 1, line 67 to Col. 2, line 17).

Barbé discloses that "two or more R to R<sup>VII</sup> can be linked to form a cyclic structure." However, there is no guidance which would enable one of ordinary skill to select R and R<sup>I</sup> for ring formation as opposed to any of the other possible R to R<sup>VII</sup> combinations. None of the specific diethers identified by Barbé as suitable electron donors possess the cyclopolyenic structure of the present invention. See col. 2, lines 18-63.

Barbé also lists other suitable diethers (Col. 2, line 63 - to Col. 3, line 31). None of these compounds possess the cyclopolyenic ring structure of the present invention, although there are several which are structural analogs of the cyclopolyenic 1,3-diethers. One of ordinary skill in the art is not given any suggestion or motivation to modify these analogs by incorporating additional unsaturation into the ring containing the central (2-position) carbon atom because (1) the seven<sup>6</sup> possible analogs listed in Barbé are listed among many other diethers, and (2) Col. 3, lines 32-39 teach that other diethers (which do not include the 2-position carbon in a saturated ring system) are preferred, thereby teaching away from the cyclopolyenic diether of the claimed invention.

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<sup>6</sup> 1,1-dimethoxymethyl-1,2,3,4-tetrahydronaphthalene,  
1,1-dimethoxymethyl-decahydronaphthalene,  
1,1-dimethoxymethyl-indane,  
2,2-dimethoxymethyl-indane,  
1,1-dimethoxymethyl-2-isopropyl-5-methylcyclohexane,  
1,1-bis(methoxymethyl)cyclohexane; and  
1,1-dimethoxymethyl-cyclopentane (Col. 3, lines 7-23).

4. Denko Fails to Disclose or Suggest Cyclopolyenic 1,3-Diethers

Denko et al. is directed to a 1,1-diether rather than a 1,3-diether and thus is even less relevant than the primary references. One of ordinary skill in the art would not consider modifying the 1,3-diethers of the primary reference by adding additional unsaturation due to Denko. The English language abstract of this reference does not suggest that 1,3-diethers should possess a cyclopolyenic structure, or that one of ordinary skill in the art would have a reasonable expectation of success that such an analog will provide a desirable balance of high stereospecificity while maintaining high catalytic activity.

B. THE HOMOLOG RULE DOES NOT EXTEND TO STRUCTURAL ANALOGS

The homolog rule does not extend to structural analogs per se. See Ex parte Brouard, 201 USPQ 538, 539 (Bd. App. 1976) ("[N]or do we agree that it would be obvious to interchange ethyl and ethenyl groups, absent some suggestion from the reference"). Instead, the prior art must supply a suggestion to substitute the cyclopolyenic 1,3-diether of the claimed invention for the saturated cyclic analogs disclosed by Albizzati '492, Albizzati '213 and Barbé. As discussed above, the references simply do not provide such a suggestion.

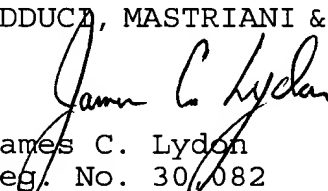
IX. CONCLUSION

The cited combination of references fails to raise a prima facie case of obviousness against the claimed invention because there is no suggestion to modify the unsaturated cyclic analogs disclosed by the primary references by incorporating additional unsaturations in the structure which includes position 2 of the 1,3-diether, and the homolog rule is not applicable to the cyclopolyenic 1,3-diethers of the present invention.

Accordingly, it is respectfully requested that this Board reverse the rejection of claims 1-6, 8-20, and 22-29, and pass this application on to allowance.

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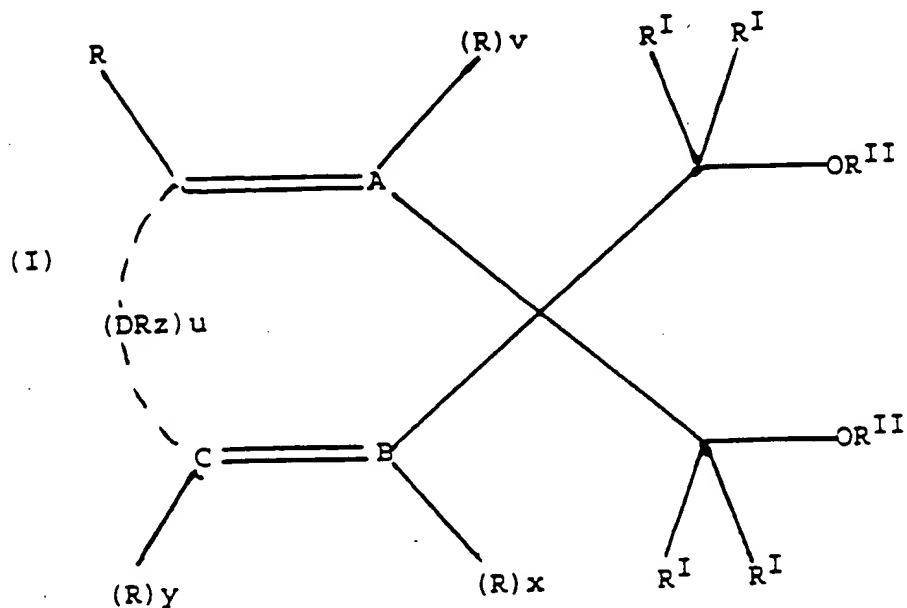


## APPENDIX

### Claims 1-29

1. A solid catalyst component for the polymerization of olefins, comprising a magnesium halide in active form, and, supported thereon, a titanium compound containing at least one Ti-halogen bond and a cyclopolyenic 1,3-diether in which the carbon atom in position 2 belongs to a cyclic or polycyclic structure made up of 5, 6, or 7 carbon atoms, or 5-n or 6-n' carbon atoms, and respectively n atoms of nitrogen and n' heteroatoms selected from the group consisting of O, S and Si, where n is 1 or 2 and n' is 1, 2 or 3, said structure containing two or three unsaturations and optionally being condensed with other cyclic structures, or substituted with one or more substituents selected from the group consisting of linear or branched alkyl radicals; cycloalkyl, aryl, aralkyl, alkaryl radicals and halogens, or being condensed with other cyclic structures and substituted with one or more of the above mentioned substituents which can also be bonded to the condensed cyclic structures; one or more of the above mentioned alkyl, cycloalkyl, aryl, aralkyl or alkaryl radicals and the condensed cyclic structures optionally containing one or more heteroatoms as substitutes for carbon or hydrogen atoms, or both.
2. The solid catalyst component of claim 1, where the carbon atoms in positions 1 and 3 in the cyclopolyenic 1,3-diether are secondary.

3. The solid catalyst component of claim 1, where the substituents in the cyclopolyenic 1,3-diether are selected from the group consisting of linear or branched C<sub>1</sub>-C<sub>20</sub> alkyl; C<sub>3</sub>-C<sub>20</sub> cycloalkyl; C<sub>6</sub>-C<sub>20</sub> aryl; C<sub>7</sub>-C<sub>20</sub> aralkyl and C<sub>7</sub>-C<sub>20</sub> alkaryl radicals; Cl and F.
4. The solid catalyst component of claim 1, where the cyclopolyenic 1,3-diether is selected from the compounds of the general formula:



where A, B, C and D are carbon atoms or heteroatoms selected from the group consisting of N, O, S and Si; v, x and y are 0 or 1; u and z are 0 or 1 or 2; provided that when u = 0:

- i) A, B and C are carbon atoms and v, x and y are equal to 1; or

- ii) A is a nitrogen atom, B and C are carbon atoms, v is equal to 0 and x and y are equal to 1; or
- iii) A and B are nitrogen atoms, C is a carbon atom, v and x are equal to 0 and y is equal to 1; or
- iv) A and B are carbon atoms, C is a nitrogen atom, v and x are equal to 1 and y is equal to 0;

when  $u = 1$ :

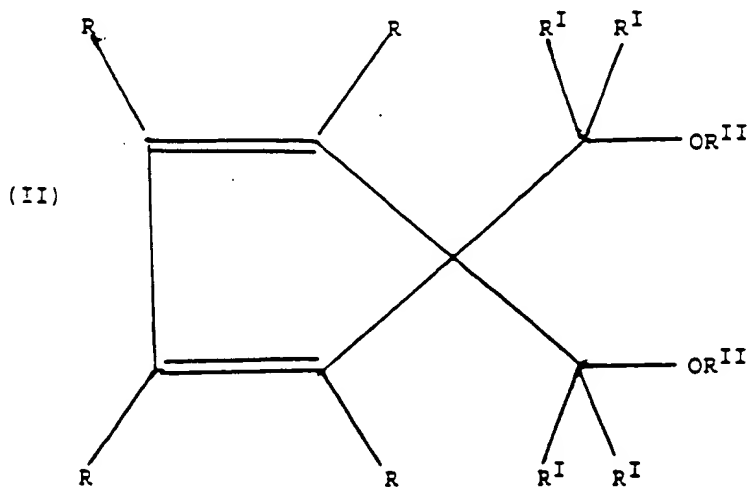
- 1) A, B, C and D are carbon atoms, v, x and y are equal to 1 and z is equal to 2; or
- 2) A and B are carbon atoms, C is a nitrogen atom, D is an oxygen atom, v and x are equal to 1, y and z are equal to 0; or
- 3) A, B and C are carbon atoms, D is an oxygen, nitrogen, sulfur, or silicon atom, v, x and y are equal to 1 and z is equal to 0 when D is an oxygen or sulfur atom, equal to 1 when D is a nitrogen atom, and equal to 2 when D is a silicon atom;

when  $u = 2$ :

A, B and C are carbon atoms, D represents two carbon atoms bonded to each other by a single or double bond, v, x and y are equal to 1 and z is equal to 1 when the couple of carbon atoms D is bonded by a double bond, and equal to 2 when said couple is bonded by a single bond; radicals R and  $R^I$ , equal or different, are selected from the group consisting of hydrogen; halogens;  $C_1$ - $C_{20}$  alkyl radicals, linear or branched;  $C_3$ - $C_{20}$  cycloalkyl,  $C_6$ - $C_{20}$  aryl,  $C_7$ - $C_{20}$  alkaryl and

C<sub>7</sub>-C<sub>20</sub> aralkyl radicals; the R<sup>I</sup> radicals, equal or different, are selected from the group consisting of C<sub>1</sub>-C<sub>20</sub> alkyl radicals, linear or branched; C<sub>3</sub>-C<sub>20</sub> cycloalkyl, C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> alkaryl and C<sub>7</sub>-C<sub>20</sub> aralkyl radicals, and two or more of the R radicals can be bonded to each other to form condensed cyclic structures, saturated or unsaturated, optionally substituted with R<sup>III</sup> radicals selected from the group consisting of halogens; C<sub>1</sub>-C<sub>20</sub> alkyl radicals, linear or branched; C<sub>3</sub>-C<sub>20</sub> cycloalkyl, C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> alkaryl and C<sub>7</sub>-C<sub>20</sub> aralkyl radicals; said radicals from R to R<sup>III</sup> optionally containing one or more heteroatoms as substitutes for carbon or hydrogen atoms, or both.

5. The solid catalyst component of claim 4, where the cyclopolyenic 1,3-diether is selected from the compounds of the general formula:



where the radicals R and R<sup>I</sup>, equal or different, are selected from the group consisting of hydrogen; halogens;

C<sub>1</sub>-C<sub>20</sub> alkyl radicals, linear or branched; C<sub>3</sub>-C<sub>20</sub> cycloalkyl, C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> alkaryl and C<sub>7</sub>-C<sub>20</sub> aralkyl radicals; the R<sup>II</sup> radicals, equal or different, are selected from the group consisting of C<sub>1</sub>-C<sub>20</sub> alkyl radicals, linear or branched; C<sub>3</sub>-C<sub>20</sub> cycloalkyl, C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> alkaryl and C<sub>7</sub>-C<sub>20</sub> aralkyl radicals, and two or more of the R radicals can be bonded to each other to form condensed cyclic structures, saturated or unsaturated, optionally substituted with R<sup>III</sup> radicals selected from the group consisting of halogens; C<sub>1</sub>-C<sub>20</sub> alkyl radicals, linear or branched; C<sub>3</sub>-C<sub>20</sub> cycloalkyl, C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> alkaryl and C<sub>7</sub>-C<sub>20</sub> aralkyl radicals; said radicals from R to R<sup>III</sup> optionally containing one or more heteroatoms as substitutes for carbon or hydrogen atoms, or both.

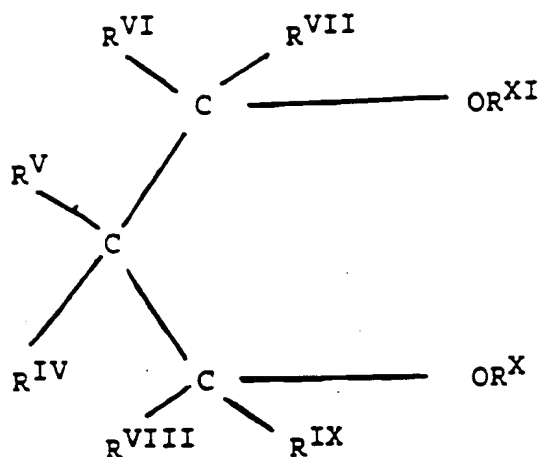
6. The solid catalyst component of claim 5, where the cyclopolyenic 1,3-diether is selected from the group consisting of:

1,1-bis(methoxymethyl)-cyclopentadiene;  
1,1-bis(methoxymethyl)-2,3,4,5-tetramethylcyclopentadiene;  
1,1-bis(methoxymethyl)-2,3,4,5-tetraphenylcyclopentadiene;  
1,1-bis(methoxymethyl)indene;  
1,1-bis(methoxymethyl)-2,3-dimethylindene;  
1,1-bis(methoxymethyl)-4,7-dimethylindene;  
1,1-bis(methoxymethyl)-4-phenyl-2-methylindene;  
1,1-bis(methoxymethyl)-7-(3,3,3-trifluoropropyl)indene;  
1,1-bis(methoxymethyl)-7-trimethylsilylindene;

1,1-bis(methoxymethyl)-7-trifluoromethylindene;  
1,1-bis(methoxymethyl)-7-methylindene;  
1,1-bis(methoxymethyl)-7-cyclopentylindene;  
1,1-bis(methoxymethyl)-7-isopropylindene;  
1,1-bis(methoxymethyl)-7-cyclohexylindene;  
1,1-bis(methoxymethyl)-7-tert-butylindene;  
1,1-bis(methoxymethyl)-7-tert-butyl-2-methylindene;  
1,1-bis(methoxymethyl)-7-phenylindene;  
1,1-bis(methoxymethyl)-2-phenylindene;  
9,9-bis(methoxymethyl)fluorene;  
9,9-bis(methoxymethyl)-2,3,6,7-tetramethylfluorene;  
9,9-bis(methoxymethyl)-2,3,4,5,6,7-hexafluorofluorene;  
9,9-bis(methoxymethyl)-2,3-benzofluorene;  
9,9-bis(methoxymethyl)-2,3,6,7-dibenzofluorene;  
9,9-bis(methoxymethyl)-2,7-diisopropylfluorene;  
9,9-bis(methoxymethyl)-1,8-dichlorofluorene;  
9,9-bis(methoxymethyl)-2,7-dicyclopentylfluorene;  
9,9-bis(methoxymethyl)-1,8-difluorofluorene;  
9,9-bis(methoxymethyl)-1,2,3,4-tetrahydrofluorene;  
9,9-bis(methoxymethyl)-1,2,3,4,5,6,7,8-octahydrofluorene;  
9,9-bis(methoxymethyl)-4-tert-butylfluorene.

7. The solid catalyst component of claim 4, where the cyclopolyenic 1,3-diether is selected from the group consisting of 9,9-bis(methoxymethyl)xanthene and 9,9-bis(methoxymethyl)-2,3,6,7-tetramethylxanthene.

8. The solid catalyst component of claim 1, where the titanium compound is selected from the group consisting of halides and halogen alcoholates.
9. The solid catalyst component of claim 8, where the titanium compound is titanium tetrachloride.
10. The solid catalyst component of claim 1, where the cyclopolyenic 1,3-diether is present in quantities ranging from 5 to 20% molar with respect to the magnesium halide.
11. The solid catalyst component of claim 1, where the Mg/Ti ratio is from 30:1 to 4:1.
12. A catalyst for the polymerization of olefins comprising the product of the reaction of:
  - a) the solid catalyst component of claim 1, with
  - b) an Al-alkyl compound, and optionally
  - c) an electron-donor compound other than the cyclopolyenic 1,3-diethers.
13. The catalyst of claim 12 where the Al-alkyl compound b) is an Al-trialkyl.
14. The catalyst of claim 12, wherein the electron-donor compound c) is selected from the group consisting of silicon compounds containing at least one Si-OR bond, where R is a hydrocarbon radical, 2,2,6,6-tetramethylpiperidine, 2,6-diisopropylpiperidine, and carboxylic acid esters.
15. The catalyst of claim 12 wherein the electron-donor compound c) is selected from the compounds having the general formula



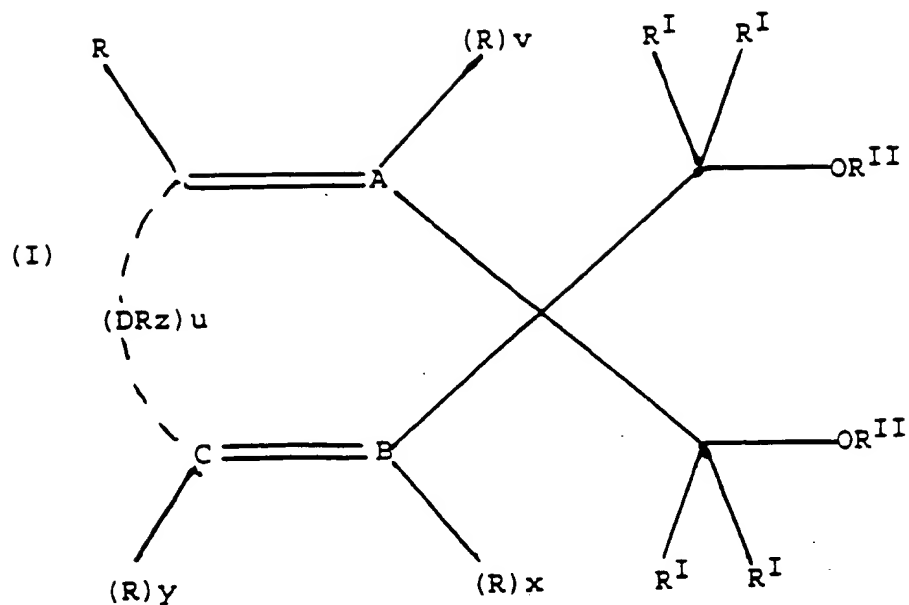
where R<sup>IV</sup>, R<sup>V</sup>, R<sup>VI</sup>, R<sup>VII</sup>, R<sup>VIII</sup> and R<sup>IX</sup> are the same or different, and are hydrogen; linear or branched C<sub>1</sub>-C<sub>18</sub> alkyl, C<sub>3</sub>-C<sub>18</sub> cycloalkyl, C<sub>6</sub>-C<sub>18</sub> aryl, C<sub>7</sub>-C<sub>18</sub> aralkyl or alkaryl radicals, provided that only one of R<sup>IV</sup> and R<sup>V</sup> can be hydrogen; R<sup>X</sup> and R<sup>XI</sup> have the same meaning as R<sup>IV</sup> and R<sup>V</sup> except for hydrogen, provided that when the radicals from R<sup>V</sup> to R<sup>IX</sup> are hydrogen and R<sup>X</sup> and R<sup>XI</sup> are methyl, R<sup>IV</sup> is not methyl; moreover, two or more of the R<sup>VI</sup> to R<sup>XI</sup> radicals can be bonded to form a cyclic structure.

16. A catalyst for the polymerization of olefins comprising the product of the reaction between:

- a<sup>1</sup>) a solid catalyst component comprising a magnesium halide in active form and, supported thereon, a titanium compound containing at least one Ti-halogen bond and an electron-donor compound;
- b) an Al-alkyl compound;
- c) a cyclopolyenic 1,3-diether in which the carbon atom in position 2 belongs to a cyclic or polycyclic structure

made up of 5, 6 or 7 carbon atoms, or of 5-n or 6-n' carbon atoms and respectively n nitrogen atoms and n' heteroatoms selected from the group consisting of O, S and Si, where n is 1 or 2, and n' is 1, 2 or 3, said structure containing two or three unsaturations and optionally being condensed with other cyclic structures, or substituted with one or more substituents selected from the group consisting of linear or branched alkyl radicals; cycloalkyl, aryl, aralkyl, alkaryl radicals and halogens, or being condensed with other cyclic structures and substituted with one or more of the above mentioned substituents that can also be bonded to the condensed cyclic structures; one or more of the above mentioned alkyl, cycloalkyl, aryl, aralkyl or alkaryl radicals and the condensed cyclic structures optionally containing one or more heteroatoms as substitutes of carbon or hydrogen atoms, or both.

17. The catalyst of claim 16, where the substituents in the cyclopolyenic 1,3-diether c) are selected from the group consisting of linear or branched C<sub>1</sub>-C<sub>20</sub> alkyl radicals; C<sub>3</sub>-C<sub>20</sub> cycloalkyl; C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> aralkyl and C<sub>7</sub>-C<sub>20</sub> alkaryl radicals; Cl and F.
18. The catalyst of claim 16, where the cyclopolyenic 1,3-diether c) is selected from the compounds of the general formula:



where A, B, C and D are carbon atoms or heteroatoms selected from the group consisting of N, O, S and Si; v, x, and y are 0 or 1; u and z are either 0 or 1 or 2;

provided that when  $u = 0$ :

- i) A, B and C are carbon atoms and v, x and y are equal to 1; or
- ii) A is a nitrogen atom, B and C are carbon atoms, v is equal to 0 and x and y are equal to 1; or
- iii) A and B are nitrogen atoms, C is a carbon atom, v and x are equal to 0 and y is equal to 1; or
- iv) A and B are carbon atoms, C is a nitrogen atom, v and x are equal to 1 and y is equal to 0;

when  $u = 1$ :

- 1) A, B, C and D are carbon atoms, v, x and y are equal to 1 and z is equal to 2; or

2) A and B are carbon atoms, C is a nitrogen atom, D is an oxygen atom, v and x are equal to 1, y and z are equal to 0; or

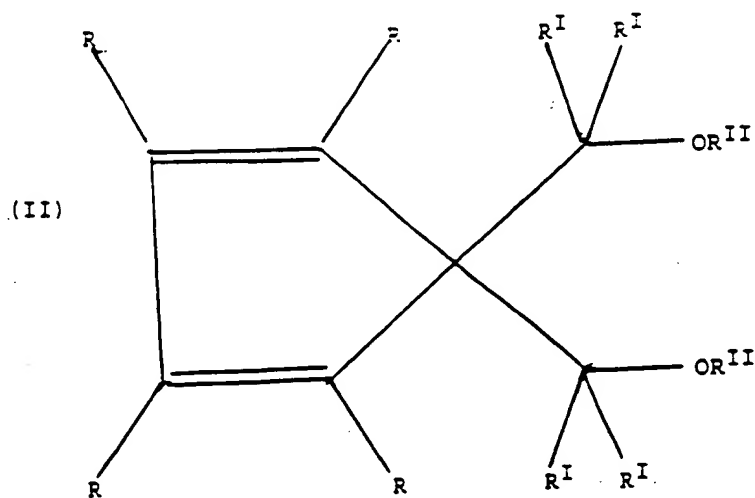
3) A, B and C are carbon atoms, D is an oxygen, nitrogen, sulfur or silicon atom, v, x and y are equal to 1 and z is equal to 0 when D is an oxygen or sulfur atom, equal to 1 when D is a nitrogen atom and equal to 2 when D is a silicon atom;

when  $u = 2$ :

A, B and C are carbon atoms, D represents two carbon atoms bonded to each other by a single or double bond, v, x and y are equal to 1 and z is equal to 1 when the couple of carbon atoms D is bonded by a double bond and equal to 2 when said couple is bonded by a single bond; radicals R and  $R^I$ , equal or different, are selected from the group consisting of hydrogen; halogens;  $C_1$ - $C_{20}$  alkyl radicals, linear or branched;  $C_3$ - $C_{20}$  cycloalkyl,  $C_6$ - $C_{20}$  aryl,  $C_7$ - $C_{20}$  alkaryl and  $C_7$ - $C_{20}$  aralkyl radicals; the  $R^{II}$  radicals, equal or different, are selected from the group consisting of  $C_1$ - $C_{20}$  alkyl radicals, linear or branched;  $C_3$ - $C_{20}$  cycloalkyl,  $C_6$ - $C_{20}$  aryl,  $C_7$ - $C_{20}$  alkaryl and  $C_7$ - $C_{20}$  aralkyl radicals, and two or more of the R radicals can be bonded to each other to form condensed cyclic structures, saturated or unsaturated, optionally substituted with  $R^{III}$  radicals selected from the group consisting of halogens;  $C_1$ - $C_{20}$  alkyl radicals, linear or branched;  $C_3$ - $C_{20}$  cycloalkyl,  $C_6$ - $C_{20}$  aryl,  $C_7$ - $C_{20}$  alkaryl

and C<sub>7</sub>-C<sub>20</sub> aralkyl radicals; said radicals from R to R<sup>III</sup> optionally containing one or more heteroatoms as substitutes for carbon or hydrogen atoms, or both.

19. The catalyst of claim 18, where the cyclopolyenic 1,3-diether c) is selected from compounds of the general formula:



where radicals R and R<sup>I</sup>, equal or different, are selected from the group consisting of hydrogen; halogens; C<sub>1</sub>-C<sub>20</sub> alkyl radicals, linear or branched; C<sub>3</sub>-C<sub>20</sub> cycloalkyl, C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> alkaryl and C<sub>7</sub>-C<sub>20</sub> aralkyl radicals; the R<sup>II</sup> radicals, equal or different, are selected from the group consisting of C<sub>1</sub>-C<sub>20</sub> alkyl radicals, linear or branched; C<sub>3</sub>-C<sub>20</sub> cycloalkyl, C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> alkaryl and C<sub>7</sub>-C<sub>20</sub> aralkyl radicals, and two or more of the R radicals can be bonded to each other to form condensed cyclic structures, saturated or unsaturated, optionally substituted with R<sup>III</sup> radicals selected from the group consisting of halogens; C<sub>1</sub>-C<sub>20</sub> alkyl

radicals, linear or branched; C<sub>3</sub>-C<sub>20</sub> cycloalkyl, C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> alkaryl and C<sub>7</sub>-C<sub>20</sub> aralkyl radicals; said radicals from R to R<sup>III</sup> optionally containing one or more heteroatoms as substitutes for carbon or hydrogen atoms, or both.

20. The catalyst of claim 19, where the cyclopolyenic 1,3-diether c) is selected from the group consisting of:

1,1-bis(methoxymethyl)-cyclopentadiene;  
1,1-bis(methoxymethyl)-2,3,4,5-tetramethylcyclopentadiene;  
1,1-bis(methoxymethyl)-2,3,4,5-tetraphenylcyclopentadiene;  
1,1-bis(methoxymethyl)indene;  
1,1-bis(methoxymethyl)-2,3-dimethylindene;  
1,1-bis(methoxymethyl)-4,7-dimethylindene;  
1,1-bis(methoxymethyl)-4-phenyl-2-methylindene;  
1,1-bis(methoxymethyl)-7-(3,3,3-trifluoropropyl)indene;  
1,1-bis(methoxymethyl)-7-trimethylsilylindene;  
1,1-bis(methoxymethyl)-7-trifluoromethylindene;  
1,1-bis(methoxymethyl)-7-methylindene;  
1,1-bis(methoxymethyl)-7-cyclopentylindene;  
1,1-bis(methoxymethyl)-7-isopropylindene;  
1,1-bis(methoxymethyl)-7-cyclohexylindene;  
1,1-bis(methoxymethyl)-7-tert-butylindene;  
1,1-bis(methoxymethyl)-7-tert-butyl-2-methylindene;  
1,1-bis(methoxymethyl)-7-phenylindene;  
1,1-bis(methoxymethyl)-2-phenylindene;  
9,9-bis(methoxymethyl)fluorene;  
9,9-bis(methoxymethyl)-2,3,6,7-tetramethylfluorene;

9,9-bis(methoxymethyl)-2,3,4,5,6,7-hexafluorofluorene;  
 9,9-bis(methoxymethyl)-2,3-benzofluorene;  
 9,9-bis(methoxymethyl)-2,3,6,7-dibenzofluorene;  
 9,9-bis(methoxymethyl)-2,7-diisopropylfluorene;  
 9,9-bis(methoxymethyl)-1,8-dichlorofluorene;  
 9,9-bis(methoxymethyl)-2,7-dicyclopentylfluorene;  
 9,9-bis(methoxymethyl)-1,8-difluorofluorene;  
 9,9-bis(methoxymethyl)-1,2,3,4-tetrahydrofluorene;  
 9,9-bis(methoxymethyl)-1,2,3,4,5,6,7,8-octahydrofluorene;  
 9,9-bis(methoxymethyl)-4-tert-butylfluorene;  
 1,1-bis( $\alpha$ -methoxybenzyl)indene;  
 1,1-bis(1'-methoxyethyl)-5,6-dichloroindene;  
 9,9-bis( $\alpha$ -methoxybenzyl)fluorene;  
 9,9-bis(1'-methoxyethyl)fluorene;  
 9-(methoxymethyl)-9-(1'-methoxyethyl)-2,3,6,7-tetrafluorofluorene;  
 9-methoxymethyl-9-pentoxymethylfluorene;  
 9-methoxymethyl-9-ethoxymethylfluorene;  
 9-methoxymethyl-9-(1'-methoxyethyl)-fluorene.

21. The catalyst of claim 18, where the cyclopolyenic 1,3-diether c) is selected from the group consisting of 9,9-bis(methoxymethyl)xanthene, and 9,9-bis(methoxymethyl)-2,3,6,7-tetramethylxanthene.
22. The catalyst of claim 16, where the Al-alkyl compound is an Al-trialkyl.

23. The catalyst of claim 16, where the titanium compound supported on the solid catalyst component a<sup>1</sup>) is selected from the group consisting of halides and halogen alcoholates.
24. The catalyst of claim 16, where the electron-donor compound supported on the solid catalyst component a<sup>1</sup>) is a Lewis base containing one or more electronegative groups where the electron-donor atoms are selected from the group consisting of N, O, S, P, As or Sn.
25. The catalyst of claim 24, where the electron-donor compound supported on the solid catalyst component a<sup>1</sup>) is an electron-donor compound that can be extracted with Al-triethyl from the catalyst component a<sup>1</sup>) for at least 70% in moles, the surface area (B.E.T.) of the solid product of extraction being at least 20 m<sup>2</sup>/g.
26. The catalyst of claim 24, where the electron-donor compound supported on the solid catalyst component a<sup>1</sup>) is a phthalic acid ester.
27. The catalyst of claim 24, where the electron-donor compound supported on the solid catalyst component a<sup>1</sup>) is an ether containing two or more ether groups and that, under standard conditions, is complexed with anhydrous magnesium chloride for less than 60 mmoles per 100 g of chloride and with TiCl<sub>4</sub> does not undergo substitution reactions, or it only does so for less than 50% in moles.

28. The catalyst of claim 24, where the electron-donor compound supported on the solid catalyst component a<sup>1</sup>) is a cyclopolyenic 1,3-diether in which the carbon atom in position 2 belongs to a cyclic or polycyclic structure made up of 5, 6 or 7 carbon atoms, or 5-n or 6-n' carbon atoms and respectively n nitrogen atoms and n' heteroatoms selected from the group consisting of N, O, S and Si, where n is 1 or 2 and n' is 1, 2 or 3, said structure containing two or three unsaturations (cyclopolyenic structure) and optionally being condensed with other cyclic structures, or substituted with one or more substituents selected from the group consisting of linear or branched alkyl radicals; cycloalkyl, aryl, aralkyl, alkaryl radicals and halogens, or being condensed with other cyclic structures and substituted with one or more of the above mentioned substituents that can also be bonded to the condensed cyclic structures; one or more of the above mentioned alkyl, cycloalkyl, aryl, aralkyl, or alkaryl radicals and the condensed cyclic structures optionally containing one or more heteroatoms as substitutes of carbon or hydrogen atoms, or both.
29. A process for the polymerization of  $\text{CH}_2=\text{CHR}$  olefins, where R is hydrogen or a 1-6 carbon alkyl radical or an aryl radical, or mixtures of said olefins or of said olefins and diolefins, said process being carried out in liquid phase in the presence or not of an aliphatic or aromatic hydrocarbon solvent, or in gas phase, or by combining polymerization

stages in liquid phase and in gas phase, in the presence of  
a catalyst as defined in claim 12 or 16.